

# STREAM

B I O E N E R G Y



## Chapter 14

## Hydrogeology

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## SUMMARY

14.1 This section of the EIS describes the hydrogeology of the application area and surrounding region and assesses the potential impact of the proposed development on the underlying groundwater environment. It is based on a desk study review of published hydrogeological data for the area, a review of previous hydrogeological investigations carried out at the Huntstown Quarry complex, and a site walkover. The natural hydrogeological regime has been altered by dewatering operations at the adjacent Huntstown Quarry which has lowered groundwater levels in the area. Water level measurements indicate that the water table beneath the subject site fluctuates from 1-2m below ground surface in winter to 9-10m during drier periods of the year. Groundwater beneath the proposed development flows toward depressions in the water table that have been created by groundwater abstraction from the quarry excavations to the west of the subject site. The local bedrock formations are considered to have low bulk permeability which is consistent with the GSI view that the bedrock in the area constitutes locally important to poor aquifers. Baseline groundwater quality indicates minimal organic contamination in the area with hydrochemistry typical of groundwater from a limestone aquifer. The residual impact of the proposed development on the hydrogeological environment is expected to be 'imperceptible'.

## INTRODUCTION

14.2 This section of the EIS describes the hydrogeology of the application area and surrounding region and identifies potential impacts associated with the proposed Renewable Bioenergy Plant, hereafter referred to as 'the plant', at Huntstown, North Road, Finglas, Dublin 11, on the hydrogeological environment. The assessment was prepared by SLR Consulting (Ireland) Ltd.

14.3 The application area of 2.38 ha (circa 5.9 acres) encompasses the proposed plant which will occupy a footprint of 1.79 ha (the subject site). The remaining 0.52 ha includes the route of the foul sewer line from the plant to the municipal sewer connection point and locations where directional signage will be erected for the plant.

- 14.4 The study presents available information on hydrogeology within and immediately beyond the subject site, together with an interpretation of the existing hydrogeological environment at the site. The scope of this section includes:
- an assessment of the existing groundwater conditions at and close to the site;
  - an assessment of the potential impact of the proposed development on groundwater conditions;
  - recommendation of mitigation measures to reduce or eliminate any potential impacts; and
  - assessment of the likely residual impact of the development after mitigation measures have been considered.
- 14.5 The study area for the purpose of this EIS comprises the site of the proposed development and the surrounding wider area including the Huntstown Quarry complex.

### Characteristics of the Proposed Development

- 14.6 A detailed description of the proposal including the plant layout, sections and elevations are presented in Chapter 2 of the EIS. In summary, the proposed 90,000 tonne per annum plant will comprise the following:
- The **Main Building** which will incorporate the waste reception, waste pre-treatment, digestate dewatering and storage areas. An odour control system will be located immediately adjacent to this building. Staff offices and welfare facilities will also be located within this building. The building will be approximately 14m tall in order to accommodate delivery/removal vehicles and to contain equipment used to treat the waste, and air treatment pipework.
  - The **Digestion Tank Farm** which will be bunded and will contain the pre-pasteurisation tanks (x2), digester feed buffer tanks (x2), digestion tanks (x4), post digestion treatment tanks (x2). The tallest tanks will be approximately 25m to the highest point.

- A **Wastewater Treatment Tank Farm** which will be bunded and will host sequential batch reactors (x3), a process liquor tank a process water tank and a sludge tank.
- 14.7 A number of ancillary structures will be located outside these three areas including gas storage and treatment facilities, the Combined Heat and Power (CHP) engines and electricity transformers, a substation, pasteurisation units, heat exchangers, a storm water storage tank, and other storage facilities etc. There will also be a dedicated vehicle refuelling area, vehicle wash, wheelwash (x2) and weighbridge.
- 14.8 The process can be broadly divided into 3 main stages:
- Pre-treatment: after waste is delivered inside the main building, material that is unsuitable for treatment by AD will be recovered (e.g. metal, plastic etc.) This material will be exported off site for further treatment, recycling or disposal. The remaining organic material will then be blended with recycled process liquid to create an organic slurry which will be heated to 70°C for at least 1 hour to meet the requirements of the Animal By-Product Regulations.
  - AD treatment: following pasteurisation the slurry will be pumped to the digestion tanks where the organic material will be broken down in the absence of oxygen in enclosed sealed tanks to produce both biogas and digestate.
  - Post treatment: in the final phase the biogas will be captured and combusted in CHP engines to produce renewable heat and electricity. The electricity will be exported to the national grid (approximately 3.8MW), enough renewable electricity to power 7,500 homes. The heat will be reused in the process and can also be made available to neighbouring activities which have a requirement for heat. The digestate will undergo moisture content reduction through the use of centrifuges to produce a cake-like material which, if derived from source separated material, can be used as a biofertiliser. The process liquor remaining after the centrifuge will be treated at the onsite WwTP which will reduce the ammonia and BOD content prior to discharge to the municipal sewer.

- 14.9 The design of the proposed plant has been undertaken using technical guidance, relevant pollution prevention guidelines and other codes of best practice in order to limit the potential for contamination of groundwater and other potential adverse impacts.
- 14.10 There are no planned discharges to ground from the proposed development and the facility is designed so that unloading of waste material and all processing at the site will be undertaken indoors and under cover on a contained concrete surface to ensure that no contamination of the underlying groundwater occurs.

## STUDY METHODOLOGY

- 14.11 This section of the EIS was prepared having regard to the following legislation, planning policy and guidance:
- EPA Guidelines on the information to be contained in Environmental Impact Statements (2002);
  - EPA Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (2003);
  - An assessment of the effects of certain public and private projects on the environment, EEC Directive (85/337/EEC);
  - EC Water Framework Directive (2000/60/EC);
  - Control of Water Pollution from Construction Sites – Guide to Good Practice (CIRIA 2002); and
  - Geology in Environmental Impact Statements Guide, The Institute of Geologists of Ireland (2002).
- 14.12 This study was prepared using published regional hydrogeological and geological data. SLR has carried out hydrogeological work at the Huntstown Quarry on behalf of Roadstone Wood Ltd (RWL) for a number of years, including borehole drilling, groundwater sampling and analysis and water level monitoring. This data is publicly available as it accompanied a recent planning application to Fingal County Council for continuation of extraction at the Huntstown quarry (Ref: FW12A10022). RWL has consented for such publicly available data to be referenced in this EIS.

- 14.13 The methodology involved in the assessment of the hydrogeology at the site can be summarised as follows:
- A desk study, in which relevant published data sources for the area were examined.
  - Review of previous hydrogeological investigations carried out at the Huntstown Quarry complex by SLR for RWL.
  - Analysis of the information gathered and assessment of the potential impacts of the development.
- 14.14 Regular field visits of the Huntstown Quarry complex were undertaken by SLR personnel during the 2009 to 2012 period. The fieldwork undertaken as part of the hydrogeological characterisation of the quarry site included:
- A walkover survey of the quarry complex and surrounding area
  - Installation of groundwater monitoring wells
  - Sampling of groundwater for laboratory analyses
  - Monitoring of groundwater levels
- 14.15 The terminology and associated criteria for defining impacts and effects on the environment are presented in **Tables 14-1 to 14-3** below. These terms are derived from EPA Guidance and are used in the assessment to describe the predicted and potential residual impacts on hydrogeology as a result of the proposed development being implemented.

**Table 14-1 Quality of Potential Impacts on the Receiving Hydrogeological Environment**

Quality of Impact	Impact Description
Negative Impact	<ul style="list-style-type: none"> <li>• A change which reduces the quality of the hydrogeological environment.</li> </ul>
Neutral Impact	<ul style="list-style-type: none"> <li>• A change which does not affect the quality of the hydrogeological environment.</li> </ul>
Positive Impact	<ul style="list-style-type: none"> <li>• A change which improves or enhances the quality of the hydrogeological environment.</li> </ul>

**Table 14-2 Significance of Hydrogeological Impacts**

Significance of Impact on the Receiving Environment	Description of Potential Impact
Imperceptible	<ul style="list-style-type: none"> <li>An impact capable of measurement but without noticeable consequences.</li> </ul>
Slight	<ul style="list-style-type: none"> <li>An impact which causes noticeable changes in the hydrogeological character of the environment without affecting its sensitivities.</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>An impact that alters the character of the hydrogeological environment in a manner that is consistent with existing and emerging trends.</li> </ul>
Significant	<ul style="list-style-type: none"> <li>An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.</li> </ul>
Profound	<ul style="list-style-type: none"> <li>An impact which obliterates sensitive characteristics.</li> </ul>

**Table 14-3 Duration of Impact**

Duration of Impact	Description
Temporary	<ul style="list-style-type: none"> <li>Impact lasting for one year or less</li> </ul>
Short-term	<ul style="list-style-type: none"> <li>Impact lasting one to seven years</li> </ul>
Medium-term	<ul style="list-style-type: none"> <li>Impact lasting seven to fifteen years</li> </ul>
Long-term	<ul style="list-style-type: none"> <li>Impact lasting fifteen to sixty years</li> </ul>
Permanent	<ul style="list-style-type: none"> <li>Impact lasting greater than sixty years</li> </ul>

## CONSULTATIONS

14.16 Pre-planning consultation was undertaken with both statutory and non-statutory consultees. Full details of the consultation process and feedback received are presented in Chapter 6 of the EIS.

14.17 Responses received which relate specifically to this hydrogeological assessment are presented in **Table 14-4**. These responses have been considered within this chapter of the EIS.

**Table 14-4 Responses Received from Consultees**

Organisation	Response Received
Geological Survey of Ireland (GSI)	None received (in relation to hydrogeology)
Department of Arts, Heritage and the Gaeltacht / National Parks and Wildlife Service	Any impact on water table levels or flows needs to be assessed in relation to potential impacts on flora, fauna and habitats
Inland Fisheries Ireland	There should be no deterioration in groundwater quality as a result of the proposed development, as the Ward and Tolka rivers are both important salmonid rivers

## Difficulties Encountered

14.18 No difficulties were encountered compiling this assessment.

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## RECEIVING ENVIRONMENT

### Site and Surrounds

- 14.19 The subject site is located along the access road to the existing Huntstown Quarry complex. The site consists of 1.79 hectares of flat ground that contains fill material above natural glacial till subsoils and Waulsortian limestone bedrock.
- 14.20 The soils and geology at the subject site and surrounding lands are described in detail in Chapter 12 of this EIS. A description of the local topography is also included in Chapter 12.
- 14.21 The subject site is located in the Ballystrahan catchment which is a sub-catchment of the Ward River surface water catchment.
- 14.22 Landuse in the area comprises quarrying, a power station, and areas of agricultural land. The agricultural land is used both for grazing and for tillage.
- 14.23 Roadstone Wood currently carries out limestone bedrock extraction (through blasting), crushing and screening at the adjacent quarry site. Excavation is carried out beneath the water table in three extraction areas and groundwater is encountered at quarry faces within all three pits. A fourth extraction area in the west of the quarry has been stripped of overburden but no rock extraction has taken place to date.
- 14.24 The existing water management system within the Huntstown Quarry complex is an integral part of the quarry operation and involves the discharge of surface water and groundwater from the quarry extraction areas under licence to both the Ward River catchment in the north and the Tolka River catchment in the south.

### Summary of Geology

#### *Subsoils*

- 14.25 Teagasc mapping of subsoils (superficial deposits) indicates that the bulk of the subject site is underlain by glacial tills derived from Carboniferous

limestones, with bedrock at, or close to, surface in the northwestern part of the site (see **Figure 12.2** in Chapter 12 for details).

## *Bedrock Geology*

- 14.26 GSI Mapping indicates that the subject site is primarily underlain by “Waulsortian” limestones of the Feltrim Limestone Formation. The Waulsortian limestones are underlain to the southeast by the Malahide Limestone Formation and overlain to the northwest by the Tober Colleen Formation (see **Figures 12.5** and **12.6** in Chapter 12 for details).
- 14.27 The underlying aquifer classification and groundwater vulnerability rating are described in Chapter 12.
- 14.28 A summary of the geological sequence and the aquifer classifications are shown on **Table 14-5** below.

**Table 14-5 Geological Sequence in the Huntstown Area and Aquifer Classifications**

Geological unit	Lithology	Aquifer Status
Quaternary Deposits	Boulder Clay / Glacial Till	None
Lucan Formation	Dark fine-grained limestone and thin shales (Calp)	LI
Tober Colleen Formation	Shales and dark limestones	PI
Feltrim Limestone Formation (Waulsortian Limestones)	Pale-grey micritic sparry limestones	LI
Malahide Limestone Formation / Boston Hill Limestone Formation	Limestones and Shales	LI

## Hydrogeology

### *Regional Hydrogeology*

- 14.29 The site is located within the Dublin Groundwater Body (GWB), which extends from Kilcock in the west to the Dublin coastline, and from the foothills of the Dublin Mountains in the south, to Dublin Airport in the North.
- 14.30 The region is dominated by a sequence of Lower Carboniferous limestone formations that vary in aquifer classification from locally important to poor aquifers, with no regionally important aquifers present (see **Figure 12.8** in Chapter 12).
- 14.31 A review of the GSI karst database indicates that there are no karst landforms or features recorded within 5km of the subject site.
- 14.32 Structurally, the site is situated in the centre of an area of folded and faulted rocks with the oldest rocks in the centre. The faulting consists of a number of ENE-WSW faults cut by a later set of NW-SE faults. A major E-W reverse fault appears to cross Huntstown Quarry to the c.400m to the north of the subject site.
- 14.33 The glacial till (boulder clay) in the region is known to have a low permeability and affords good protection to the underlying groundwater from potential sources of contamination. Groundwater vulnerability is therefore low where there is significant depth of this boulder clay, but this is not the case proximal to the subject site and the adjacent Huntstown Quarry where the bedrock is at or close to surface (see **Figure 12.9** in Chapter 12 for details of groundwater vulnerability).

### *Local Hydrogeology*

- 14.34 The predominant bedrock at Huntstown is limestone, grouped into the Waulsortian (Feltrim), Malahide, Tober Colleen, and Lucan Formations, as previously described. As is typical of Irish bedrock, groundwater flow through these formations is controlled by secondary fissure permeability. Groundwater storage and movement is mainly constrained to the upper

weathered horizons of each unit and to discontinuities (such as joints, fractures and faults). Minor dolomitisation has been observed along fractures within the Waulsortian and Malahide limestone formations, but more extensive dolomitisation of the limestone bedrock appears absent.

- 14.35 Six groundwater monitoring wells (designated GW01 – GW06) were installed across the Huntstown Quarry complex in July 2010 as part of the RWL planning application for continuation of use of the quarry. The locations of these monitoring wells are shown on **Figure 14-1**. The well construction records are presented in **Appendix 12-2** in Chapter 12.
- 14.36 The boreholes were drilled to a depth of between 49m and 80.5m. Groundwater monitoring piezometers were installed at particular levels in order that specific response zones could be isolated from other water ingress.
- 14.37 GW01, drilled c.400m to the southeast of the subject site in Waulsortian Limestone over Malahide Formation shale and limestone, struck groundwater at 54m below ground level at a contact point between shale and limestone beds within the Malahide Formation.
- 14.38 GW02, drilled c.200m to the southwest of the subject site also in Waulsortian Limestones over Malahide Formation shale and limestone, struck groundwater at the top of the bedrock and also within the Waulsortian Limestones at c.12mbgl and again at c.32mbgl.
- 14.39 GW03, drilled c.400m to the north of the subject site in Malahide Formation limestone and shale/mudstone, struck water at three depths within the bedrock, relatively consistent with observed fracture zones at c.18m, c.32m and c.44m below ground.
- 14.40 GW04, drilled in the Malahide Formation c.1km northwest of the subject site, struck water at the top of the bedrock and again at c.54mbgl at a fracture zone within the Mudstone bedrock.

- 14.41 GW05, drilled c.1km west of the subject site in the Lucan Formation, struck water at c.15mbgl in black coarsely-crystalline limestone. This was close to a fracture zone at c.17mbgl.
- 14.42 GW06, drilled c.1km southwest of the subject site in the Malahide Formation, struck water at c.49mbgl in black limestone with calcite veining.
- 14.43 The water strikes in the 6 monitoring wells were generally observed at the rockhead, contact zones or in fracture zones, often containing calcite or dolomite veins. This is consistent with the view that groundwater flow in the area is controlled by structures, rather than lithologies. GW03 is located very close to a major reverse fault (see **Figure 12-6**), which probably explains the multiple water strikes observed in the borehole log.
- 14.44 A summary of groundwater strikes recorded during the groundwater well installation works in July 2010 at the Huntstown Quarry complex is presented in **Table 14-6** below, along with other pertinent information.

**Table 14-6 Groundwater Strikes Recorded during Well Drilling**

Borehole Name	Well depth (m)	Water Strike (mbgl)	Water Strike (mOD)	Water Depth (mbTOC) 05/08/10	Water Level (mOD) 05/08/10
GW01	61	54	26.98	25.47	56.27
GW02	55	32	49.51	11.99	70.34
GW03	49	32	46.94	20.46	58.01
GW04	61	54	26.88	29.59	52.14
GW05	55	14.5	70.01	10.81	74.52
GW06	80.5	49	33.16	40.46	42.32

## Recharge

- 14.45 Dublin Airport synoptic weather station receives a mean annual rainfall of 758mm (based on the 1981-2010 average). The long-term mean annual Potential Evaporation (PE) measured at Dublin Airport since records began is approximately 440mm/year (European Climate Assessment & Dataset website). In this region, average actual evapotranspiration (AE) is likely to be

in the order of 90% of PE, approximately 396mm/year. The average effective rainfall is obtained by subtracting the AE from the rainfall. Therefore in this area, effective rainfall (water available for surface water runoff and potential groundwater recharge) is in the order of 362mm/year.

- 14.46 The Water Framework Directive's Working Group on Groundwater (2005) has suggested that a reasonable 'cap' on recharge to locally important aquifers would be about 200mm/year and that potential groundwater recharge in excess of this will be rejected as interflow at the top of bedrock - in this case about 162mm/year.
- 14.47 At the adjacent quarry and in the immediate area of the subject site, the AE will be lower due to the absence of significant vegetation cover, and therefore the AE is assumed to be approximately 200mm/year. In this case the average effective rainfall, of about 558mm/year (758 less 200), has to be pumped from the quarry excavations as they receive both groundwater recharge and surface water runoff.

### *Groundwater Levels and Flow*

- 14.48 The three quarry extraction areas have intersected the water table and lowered it around the periphery with the excavation of each quarry bench. There are minor groundwater inflows to each of the excavations that drain to the quarry floors, where they are contained. There is a fourth extraction area to the west of the quarry site where the overburden cover has been stripped and no rock extraction has taken place to date.
- 14.49 Water is pumped from the quarry floor as and when required in order to maintain dry conditions on the floor. When pumps are active, the northern and southern quarries have estimated discharge rates of around 30 l/sec and 80 l/sec respectively. However, it should be noted that this includes local surface water flows into the quarry from surrounding lands.
- 14.50 **Figure 14-2** shows the groundwater contours and flow directions at Huntstown in August 2010, based on the data presented above in **Table 14-6**. Management of groundwater in Huntstown Quarry has resulted in the

development of two major cones of depression, as shown in **Figure 14-2**. Groundwater in the area and beneath the subject site flows to one or both of these depressions in the water table, depending on the development of the quarry excavations and the rate of groundwater abstraction.

- 14.51 The depths to groundwater indicate that the existing dewatering operations at the quarry have lowered groundwater levels over a significant area (**Table 14-6**). Based on the distance-drawdown method, it is estimated that a reduction of 2m in groundwater levels extends c.1.1 km from the South and North quarries. Beyond this distance the water level drawdown will merge with the natural seasonal fluctuation in groundwater levels.
- 14.52 The groundwater contour map indicates that the floor of the south quarry at 33mOD was at least 37m below the groundwater table level contoured at the subject site in August 2010, at approximately 70mOD. The floor of the north quarry at 39mOD was at least 31m below the groundwater table at the subject site on that date. Ground level at the subject site occurs at 78 to 79mOD. The steepness of the cone of depression at Huntstown Quarry complex suggests low bulk permeability in the local bedrock formations, consistent with the GSI view that the bedrock in the area constitutes locally important to poor aquifers.
- 14.53 As a result of groundwater abstraction from the quarry excavations the natural hydraulic regime has been altered significantly. It is likely that prior to pumping the groundwaters in the Waulsortian Limestones were unconfined.
- 14.54 Currently the water table levels are mainly below the base of the Quaternary subsoils. Under natural conditions the thin cover of these strata would allow a portion of potential recharge to infiltrate to the underlying bedrock aquifer.
- 14.55 The water level data presented below, also suggests that the water table at the subject site could be up to 7 metres higher in winter months, which would bring it within about 1 to 2 metres of ground surface which is at an elevation of 78 to 79mOD. The watertable falls to about 9 to 10m below ground level at the subject site after the summer period.

- 14.56 At some unknown point in the future, quarry operations will cease at Huntstown and dewatering is likely to be discontinued. In this scenario, groundwater levels will rebound to a level closer to the surface of the subject site, than at present. Owing to the higher permeability in the area resulting from quarrying, the level will be a little lower than the pre-quarrying level.
- 14.57 The formation levels at the base of the subject site are designed to be at or above existing ground levels. The base will be sealed and drainage at and around the base will be directed to surface water drains. Therefore, rebound of the water table after the quarry is restored will not result in a negative impact to the proposed development or a negative impact to the groundwater beneath the site.
- 14.58 The water level data presented above (**Table 14-6**) were recorded on the 5 August 2010, approximately three weeks after the completion of drilling and groundwater monitoring well installation. Groundwater level monitoring at the Huntstown Quarry complex is on-going on at least a monthly frequency. Water level data recorded at the site by RWL as part of the ongoing Environmental Management System (EMS) is presented in **Table 14-7** below.

**Table 14-7 Groundwater Levels Recorded at Huntstown Quarry**

Hole ID		GW01	GW02	GW03	GW04	GW05	GW06
Easting		311785	311157	311274	310466	310272	310847
Northing		240902	241167	241774	241917	241374	240362
Top of Casing (Steel) Elevation (mOD)		81.74	82.33	78.47	81.73	85.33	82.78
Water Depth (mbTOC)	05-08-10	25.47	11.99	20.46	29.59	10.81	40.46
Water Elev. (mOD)		56.27	70.34	58.01	52.14	74.52	42.32
Water Depth (mbTOC)	19-08-10	25.79	6.95	20.81	30.3	11.34	40.94
Water Elev. (mOD)		55.95	75.38	57.66	51.43	73.99	41.84
Water Depth (mbTOC)	16-09-10	-	13.09	20.58	30.84	9.04	40.21
Water Elev. (mOD)		-	69.24	57.89	50.89	76.29	42.57
Water Depth (mbTOC)	20-09-10	25.83	10.54	20.47	-	10.54	41.05
Water Elev. (mOD)		55.91	71.79	58	-	74.79	41.73
Water Depth (mbTOC)	29-09-10	25.7	5.67	20.86	-	8.29	39.25
Water Elev. (mOD)		56.04	76.66	57.61	-	77.04	43.53

# HYDROGEOLOGY 14

Hole ID		GW01	GW02	GW03	GW04	GW05	GW06
Water Depth (mbTOC)	04-11-10	26.1	-	21.4	-	8.7	40.9
Water Elev. (mOD)		55.64	-	57.07	-	76.63	41.88
Water Depth (mbTOC)	17-11-10	25.71	5.48	20.48	-	5.69	38.91
Water Elev. (mOD)		56.03	76.85	57.99	-	79.64	43.87
Water Depth (mbTOC)	01-12-10	23.69	4.7	18.57	-	4.01	37.4
Water Elev. (mOD)		58.05	77.63	59.9	-	81.32	45.38
Water Depth (mbTOC)	27-01-11	23.69	4.7	18.57	-	4.01	37.4
Water Elev. (mOD)		58.05	77.63	59.9	-	81.32	45.38
Water Depth (mbTOC)	25-05-11	26.89	10.56	22.12	-	9.68	41.18
Water Elev. (mOD)		54.85	71.77	56.35	-	75.65	41.6
Water Depth (mbTOC)	14-07-11	27.51	12.18	22.22	30.73	11.27	41.72
Water Elev. (mOD)		54.23	70.15	56.25	51	74.06	41.06
<b>Maximum Groundwater Level</b>		<b>58.05</b>	<b>77.63</b>	<b>59.9</b>	<b>52.14</b>	<b>81.32</b>	<b>45.38</b>
<b>Minimum Groundwater Level</b>		<b>54.23</b>	<b>69.24</b>	<b>56.25</b>	<b>50.89</b>	<b>73.99</b>	<b>41.06</b>

mbTOC = metres below Top of Casing (steel)

## Groundwater Abstractions

14.52 The GSI national well database records indicate that there are no private wells within 1km of the proposed development. The nearest recorded wells are a trial well 1.1km to the east in the townland of Baleskin (Irish Grid Ref. 312604, 241403) and a domestic/agricultural well 1.6km to the south in the townland of Cappogue (Irish Grid Ref. 311315, 239554). It is unclear if the trial well to the east is in use - it was drilled at the site of the Baleskin Reception Centre for refugees but is unlikely to be able to meet the water demand of such a facility with the reported yield of 84m<sup>3</sup>/day. The domestic/agricultural well to the south is probably in use. The well to the east is drilled in the Waulsortian Limestone Formation and the well to the south is drilled in the Tober Colleen Formation (see **Figure 14-3**).

14.53 The potable water demand at Huntstown Quarry is satisfied by a Local Authority mains supply. All other water requirements at the site (i.e. for concrete, aggregated washing and processing) are sourced from sumps on the quarry floor which collect groundwater ingress and run-off water. These

sumps are pumped when required to maintain dry conditions on the quarry floor.

- 14.54 The adjoining Huntstown Power Station abstracts an average between 93-146m<sup>3</sup>/day of groundwater from an on-site well for operational use (Huntstown Power Station Annual Environmental Reports, 2008-2011).
- 14.55 Much of the water demand in Huntstown and the surrounding area is satisfied by a Local Authority mains supply.
- 14.56 The proposed development will use mains water for potable supplies at the site. Rainwater will be harvested from roofs, bunded areas, and roads for use on site. There will be no requirement for groundwater abstractions to facilitate the proposed development.

### *Groundwater Quality*

- 14.57 As part of the environmental monitoring programme for Huntstown Quarry, groundwater samples were obtained from all six RWL groundwater monitoring wells (identified as GW01 – GW06) in August 2010 and forwarded for hydrochemical analysis. The results of the analyses are contained in **Appendix 14-1**.
- 14.58 The hydrochemistry of the groundwater samples indicate hard calcium-magnesium-bicarbonate waters with moderately low sodium and magnesium. This type of water is typical of groundwater from a limestone aquifer. Potassium, chloride, ammoniacal nitrogen, nitrite and nitrate are moderate indicating minimal organic contamination.
- 14.59 Under Ireland's obligations for the Water Framework Directive, the status of groundwater bodies nationally has been assessed, both on the basis of their quality and availability. This information is only currently available in draft form, but for the Dublin GWB, it suggests the following:
- that it is at significant risk from point source pollution (risk category 1a);
  - that it is probably at significant risk from diffuse source pollution (risk category 1b); and

- that it is not at significant risk from abstraction and saline intrusion (risk category 2a).

The overall risk category for the GWB is therefore set at '1a'. However, because the Dublin GWB is situated beneath a large urban area, it is likely to be the subject of less stringent management objectives (in the river basin management plan) than other areas.

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## IMPACT ASSESSMENT

- 14.60 This Section addresses the impacts of the proposed development on the groundwater environment in terms of the Quality, Significance and Duration of each potential impact.
- 14.61 **Tables 14-1 to 14-3** presented in section 14.15 of this assessment explains the terminology and associated criteria for defining impacts and effects on the environment. These terms are derived from EPA Guidance and are used in the following paragraphs to describe the predicted and potential residual impacts on hydrogeology as a result of the proposed development being implemented.

### ‘Do Nothing’

- 14.62 In the “do nothing” scenario there will be no immediate impact on the groundwater beneath the site and surrounding area. The site is zoned for ‘Heavy Industry’ in the Fingal Development Plan (2011 – 2017), so it is likely that the site will be developed at some time in the future if it is not developed under the current proposal.
- 14.63 The proposed plant is designed to accept and treat biodegradable wastes that are currently disposed at landfill sites. The diversion of these wastes from landfill will have a positive indirect impact on hydrogeology by reducing the risk of groundwater contamination from leachate generated at existing landfills. Process effluent will be captured and processed within an enclosed system at the proposed plant, and all waste received will be handled under roof and in buildings with concrete floors, thus providing superior control and management of potentially polluting materials than at engineered landfills, where lining systems are prone to leakage.

### Construction Phase Impacts

- 14.64 There is a risk of hydrocarbon spillage from plant and machinery or fuel tanks used during the construction of the proposed development. Any such spillage, if unmitigated, could have a negative impact on underlying groundwater that would be temporary in duration.

- 14.65 However, any spills would consist of relatively small volumes that can be quickly cleaned from the ground surface. Furthermore, given the nature and thickness of the low permeability glacial tills that extend across the subject site, the potential for any spillages to migrate off site or through the ground to the underlying groundwater, is considered low/negligible. Any contaminated soil will be contained and treated in accordance with the mitigation measures outlined below.
- 14.66 Construction at the site will be relatively shallow and is not expected to significantly interfere with water levels beneath the site. Some temporary dewatering could be required as concrete foundations are laid. This may depend on the time of year that construction proceeds. This impact is considered to be temporary in duration and the significance is considered to be slight. The quality of an impact of this nature is considered neutral as it reduces groundwater flow to the quarry and reduces the need for management of excess groundwater inflows by the quarry operator.

### Operational Phase Impacts

- 14.67 There are no direct or planned discharges to ground included as part of the proposed development. Accidental discharges of process effluent or hydrocarbons could have an adverse impact on groundwater if not fully contained.
- 14.68 The impact of any accidental process water or hydrocarbon discharge from the plant during the operational phase is considered to be short term in duration, if it is not contained immediately after the incident. If any contaminants manage to migrate through the underlying low permeability subsoil to the groundwater, the base of the quarry is the most likely downgradient receptor of such contamination. An incident of this nature would require management of the contaminant plume in a manner that would avoid the pumping of contaminated groundwater from the base of the quarry to surface water. Without mitigation measures, the significance of the impact of contaminated water on the receiving environment is considered to be significant. The quality of any impact would be negative as the accidental discharge would lead to a reduction in water quality in the underlying aquifer.

However, the steep gradients in the water table around the quarry, evident from the water table contour map (**Figure 14-1**), suggest that the limestone bedrock beneath the site has a low bulk permeability and adequate time will be available to contain a contaminant plume before it would reach the quarry floor and be pumped to surface water. Furthermore, any spills would consist of relatively small volumes that can be quickly cleaned from the ground surface. Given the nature and thickness of the low permeability glacial tills that extend across the subject site, the potential for any spillages to migrate off site or through the ground to the underlying groundwater, is considered low/negligible. Any contaminated soil will be contained and treated in accordance with the mitigation measures outlined below.

- 14.69 As the majority of existing 'made ground' is replaced with concrete surfaces, potential recharge to groundwater at the site will be reduced. This is expected to be a long term impact, but the significance is considered imperceptible in the context of the relatively small recharge area affected and the low permeability of the boulder clay subsoils that extend across the subject site. The quality of an impact of this nature is considered neutral as it slightly reduces groundwater flow to the quarry thus reducing the need for management of excess groundwater inflows by the quarry operator.

### *Summary of Unmitigated Potential Impacts*

- 14.70 The results of this impact assessment on the hydrogeological receiving environment are summarised below.

## MITIGATION MEASURES

- 14.71 Mitigation measures to avoid the potential impacts detailed above during the construction and operational phases of the development are described here.

### Construction Phase Mitigation

- 14.72 During construction plant and machinery will be required on site and as a result it is appropriate to adopt best working practices and measures to protect the underlying groundwater. Accidental spillage of fuels or chemical reagents on site pose a potential contamination risk. To minimise this risk

the following mitigation measures have been identified which will form part of a Construction Environmental Management Plan (CEMP):

- Fuel will be stored in bunded tanks with the provision of a storage / retention capacity of 110% of tank storage volume and will be stored in a designated area away from general site traffic movements;
- Oils, greases and hydraulic fluids will be stored under cover in a bunded area;
- Refuelling and the servicing of plant and machinery will only occur in areas of hard standing which have been designated for this purpose;
- Good site management practices will be implemented to reduce risks of spills, including regular monitoring and inspection of construction storage vessels and ensuring that all plant is properly maintained and serviced; and
- A contingency plan will also be developed to deal with potential leaks and spills and an emergency spill response kit will be maintained on site (see **Appendix 14-2**).
- Any soil contaminated from an accidental spillage will be contained and treated appropriately and in accordance with the Waste Management Act 1996-2012.

## Operational Phase Mitigation

14.73 The avoidance of impacts is integral to the design and operation of the proposed plant. During the operational phase of the proposed development the primary potential impacts relate to the accidental or uncontrolled discharge of process effluent or fuels and chemicals to groundwater. To minimise any groundwater contamination risk arising from the proposed development the following mitigation measures have been identified:

- All chemicals at the site will be stored under cover in a bunded area or in double skinned storage tanks;
- All fuels will be stored in bunded tanks with the provision of a storage / retention capacity of 110% of tank storage volume and will be stored in a designated area;

- All onsite vehicles will be regularly maintained and checked to ensure any damages or leakages are repaired;
- All process liquor/effluent will be circulated in enclosed pipes and stored in covered tanks. The tanks will be located in areas which are bunded to 110% of the largest tank capacity;
- All process effluent will be treated on site in a bunded WwTP and discharged under consent from the EPA to the local foul sewer network;
- Process water from the vehicle wash down area and from the wheel washes will be directed to the onsite WwTP before being discharged off site to the foul sewer network;
- Washdown water from the building floor will be captured and directed back into the digestion process;
- Rainfall runoff from roofs, bunded tank farms, roads and hardstand areas will be harvested and reused on-site. Any excess runoff will be discharged to the local surface water network following attenuation and treatment in a petrol interceptor. There will be no discharge of stormwater runoff to ground;
- The plant is designed so that in the event of a major accident at the facility, all contaminated runoff will be retained on site for appropriate treatment and disposal; and
- All unloading of waste material and all processing at the site will be undertaken indoors under cover on a contained concrete surface to ensure that no contamination escapes to ground.

14.74 Any soil contaminated from an accidental spillage will be contained and treated appropriately and in accordance with the Waste Management Act 1996-2012. These mitigation measures will reduce the risk of contamination to the underlying groundwater environment as a result of the operation of the proposed plant.

## RESIDUAL IMPACTS

- 14.75 The potential impacts of the proposed development upon the hydrogeological receiving environment have been identified and assessed, and where appropriate, mitigation measures have been incorporated into the design of the development.
- 14.76 There will be no direct discharge to ground. All waste materials and fuels will be stored and handled in areas that are designed for containment. Emergency procedures will be put in place for dealing with accidents or incidents that could lead to groundwater contamination.
- 14.77 Any de-watering during construction, if necessary, will be temporary and water levels will rapidly revert to pre-development levels.
- 14.78 The proposed development will not impact on the quality or rate of any groundwater abstractions in the area.
- 14.79 Future recovery/rebound of groundwater levels associated with remediation of Huntstown Quarry will not impact on the proposed development.
- 14.80 With incorporation of the proposed mitigation measures, the residual impacts from the proposed development on the hydrogeological environment are expected to be imperceptible, see **Table 14.8** below for details.

Table 14-8 Summary of Potential Impacts, Mitigation Measures & Residual Impacts

Potential Impact on Hydrogeology	Duration of Impact	Significance of Impact	Quality of Impact	Proposed Mitigation Measures	Mitigated Residual Impact	Mitigated Quality of Residual Impact
<b>Construction Phase</b>						
Contaminants such as process effluent or diesel entering groundwater	Temporary	<b>Significant</b>	Negative	Bunded fuel tanks; Chemicals and Oils storage; Hard standing area for refuelling; Site and equipment management; Emergency spill management plan; Emergency Spill Kit; Containment of any contaminated soil.	<b>Imperceptible</b>	Neutral
<b>Operational Phase</b>						
Accidental discharge of effluent to groundwater	Short Term	<b>Significant</b>	Negative	Process effluent stored in tanks in bunded area; Process effluent treated and discharged to foul sewer; Waste received and processed in building with contained concrete floor.	<b>Imperceptible</b>	Neutral
Accidental discharge of hydrocarbons or other fuels to groundwater	Short Term	<b>Significant</b>	Negative	Chemical storage under cover and bunded; Fuel storage bunded; Hard standing area for refuelling; Site and equipment management; Emergency spill management plan; Emergency Spill Kit; Containment of any contaminated soil.	<b>Imperceptible</b>	Neutral

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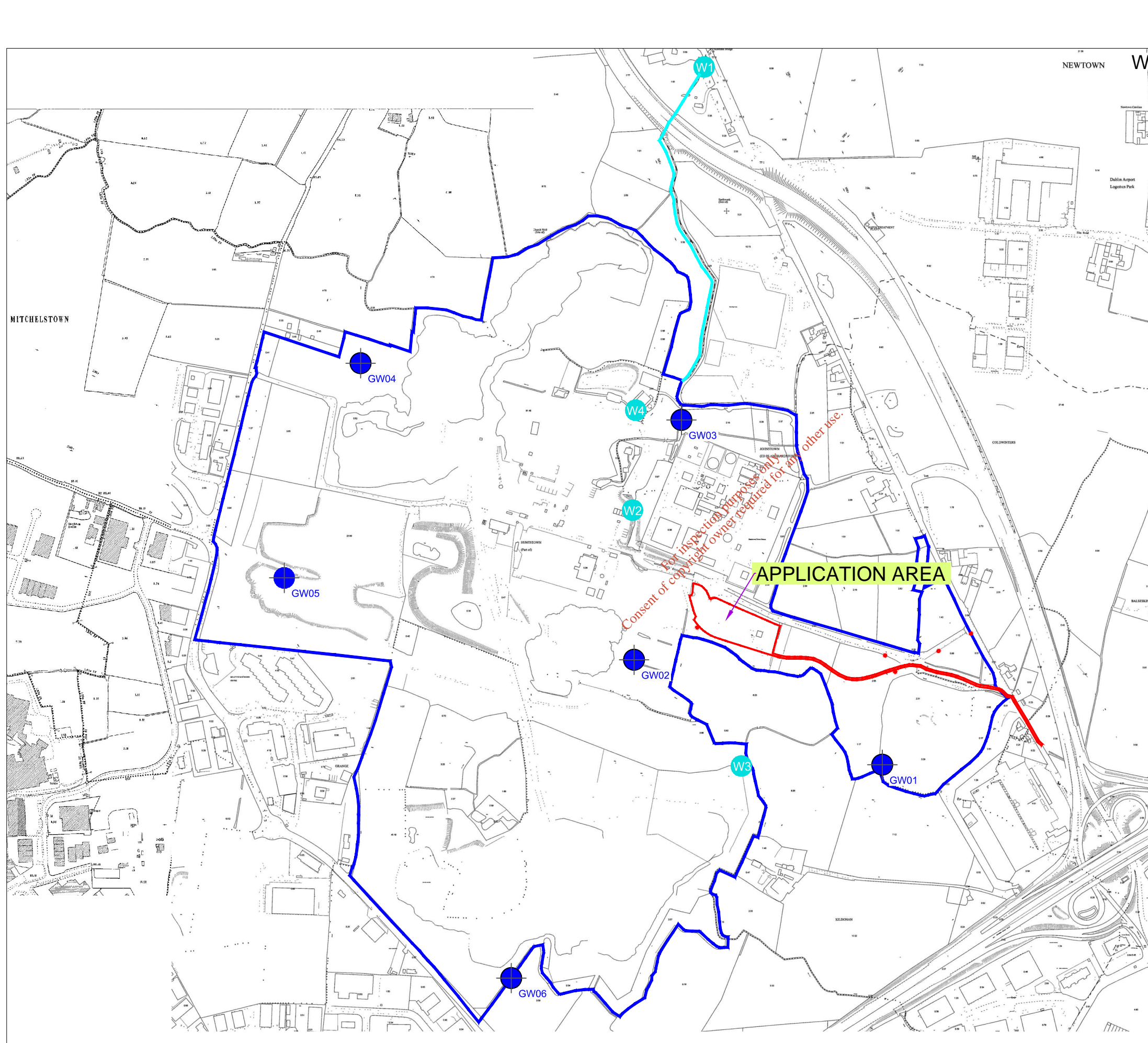
## FIGURES

**Figure 14-1 Groundwater and Surface Water Monitoring Locations**

**Figure 14-2 Groundwater Levels**

**Figure 14-3 Nearest Local Wells**

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**NOTES**

1. BASED ON 1:1000 & 1:2500 ORDNANCE SURVEY IRELAND DIGITAL MAPPING - MAP NO's. - 3063A, 3063C, 3062B, 3062C, 3062D, 3130A, 3130B, 3131-01 & 3131-06

2. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000713 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

**LEGEND**

	APPLICATION AREA
	HUNTSTOWN QUARRY
	GROUNDWATER MONITORING WELL LOCATION
	SURFACE WATER MONITORING LOCATION

R2	EW	TP	07/13	
Revision	Drawn By	Chk By	Date	Comments

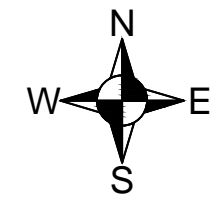
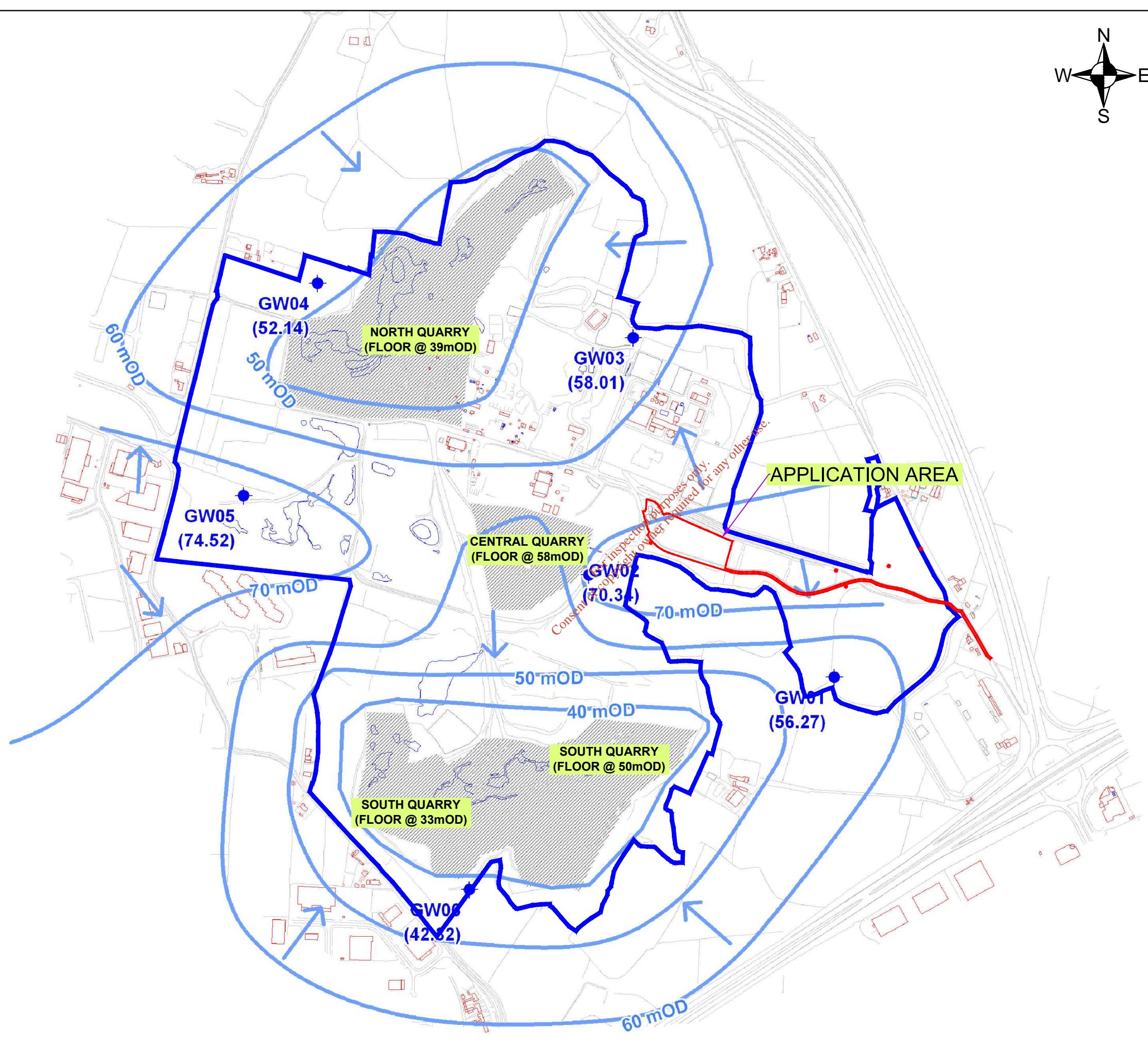
**STREAM**  
CLIENT: **BIOENERGY**

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FINGLAS, DUBLIN 11  
**TITLE: GROUNDWATER & SURFACE  
WATER MONITORING POINT LOCATIONS**

**FIGURE 14.1**

Scale 1:10,000 @ A3	Date 09.08.2013
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**NOTES**

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAP NO. 50
2. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000713 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND
3. GROUNDWATER LEVELS WERE RECORDED ON THE 05/08/2013

**LEGEND**

	APPLICATION AREA
	HUNTSTOWN QUARRY
	QUARRIED AREAS
	MONITORING WELLS (GROUNDWATER ELEVATION ON 05.08.2010)
	GROUNDWATER FLOW DIRECTION
	CONTOURS OF EQUAL GROUNDWATER ELEVATION

R2	EW	TP	07/13	
Revision	Drawn By	Chkd By	Date	Comments

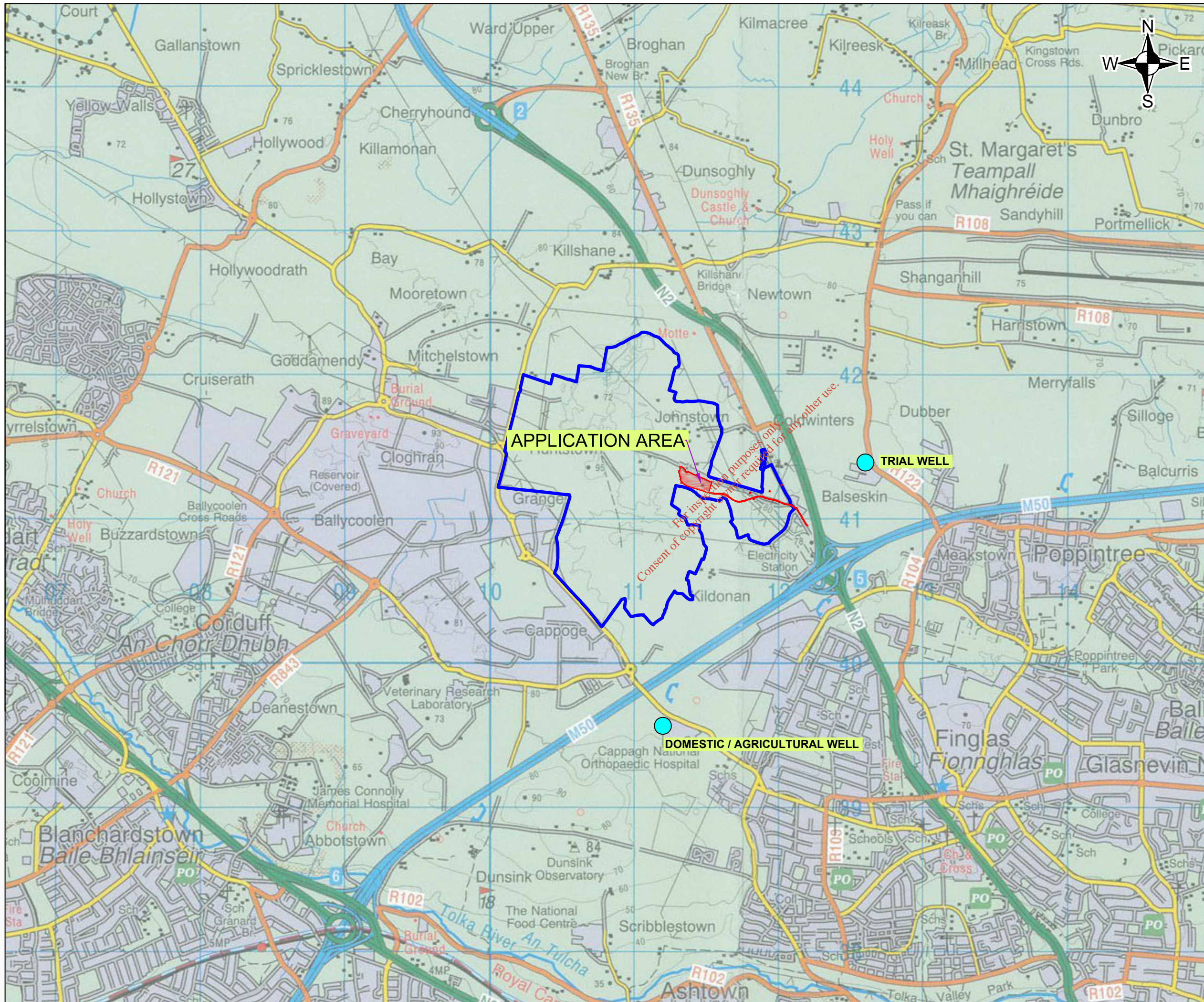
**CLIENT:** **STREAM** BIOENERGY

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**FIGURE 14.2**



Scale 1:10,000 @ A3	Date 09.08.2013
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NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAP NO. 50
2. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000713 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

LEGEND

-  APPLICATION AREA
-  HUNTSTOWN QUARRY

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**FIGURE 14.3**

Scale	Date
1:25,000 @ A3	09.08.2013

## APPENDICES (See Volume III)

### Appendix 14-1 Water Quality Results

### Appendix 14-2 Spill Kit Details

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